# Climate Change and Agriculture: A Summary of USDA Activities

**Presentation to**

**USDA Agricultural Air Quality Task Force**

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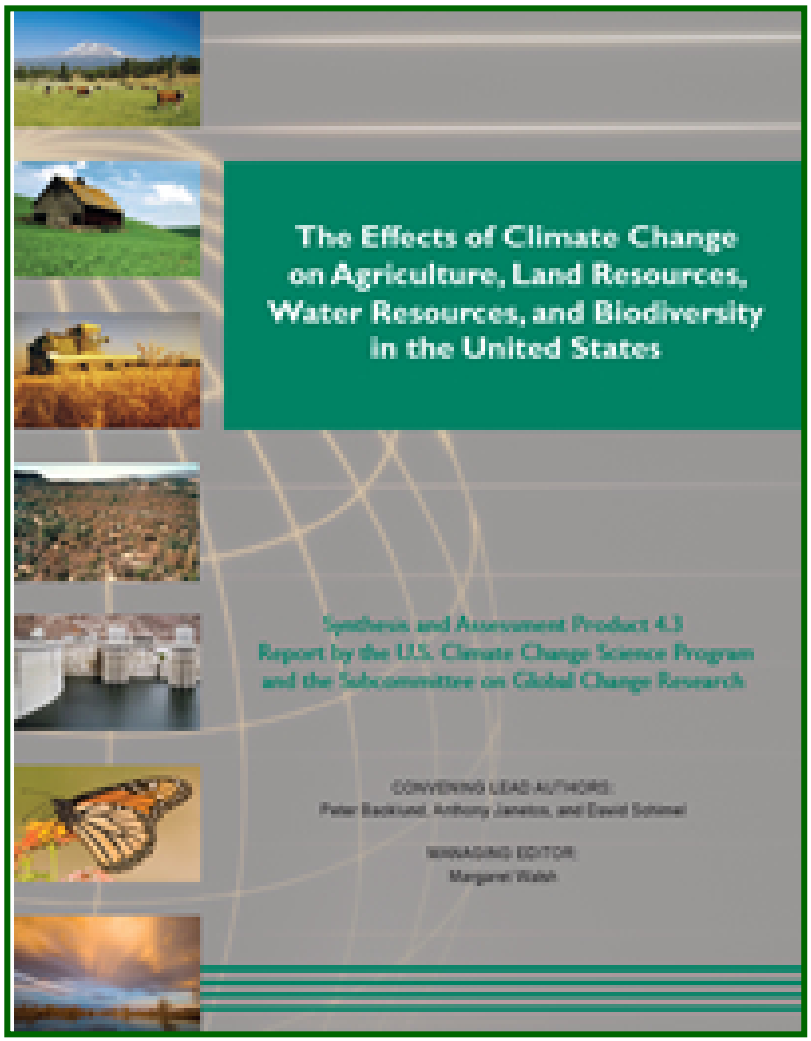
# The Effects of Climate Change On Agriculture

# USDA Recently Released a Comprehensive Assessment of Climate Change and Agriculture




USDA coordinated the production of CCSP Synthesis and Assessment Report 4.3 –

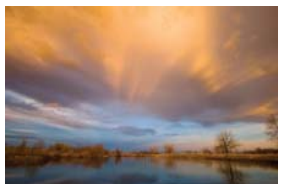
The Effects of Climate Change on Agriculture, Land Resources, Water Resource, and Biodiversity in the United States

http://www.usda.gov/oce/global_change/sap_2007_FinalReport.htm









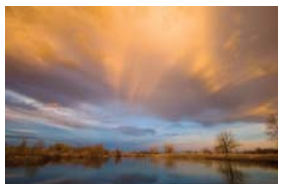
# Assessment Findings: Crop Agriculture

- With increased $CO_2$ and temperature, the life cycle of grain and oilseed crops will likely progress more rapidly.
- As temperature rises, these crops will increasingly begin to experience failure, especially if climate variability increases and precipitation lessens or becomes more variable.
- The marketable yield of many horticultural crops – e.g. tomatoes, onions, fruits – is very likely to be more sensitive to climate change than grain and oilseed crops.
- Climate change is likely to lead to a northern migration of weeds. Many weeds respond more positively to increasing $CO_2$ than most cash crops, particularly C3 “invasive” weeds.
- Disease pressure on crops and domestic animals will likely increase with earlier springs and warmer winters, which will allow proliferation and higher survival rates of pathogens and parasites.









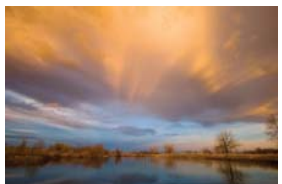
# Assessment Findings: Animal Agriculture

- Projected increases in temperature and a lengthening of the growing season will likely extend forage production into late fall and early spring, thereby decreasing need for winter season forage reserves.
- However, these benefits will very likely be affected by regional variations in water availability.
- Climate change-induced shifts in plant species are already under way in rangelands. Establishment of perennial herbaceous species is reducing soil water availability early in the growing season. Shifts in plant productivity and type will likely also have significant impact on livestock operations.
- Higher temperatures will very likely reduce livestock production during the summer season.
- For ruminants, current management systems generally do not provide shelter to buffer the adverse effects of changing climate; such protection is more frequently available for non-ruminants (e.g., swine and poultry).









# Assessment Findings: Water

- Most of the continental United States experienced reductions in drought severity and duration over the 20th century. However, there is some indication of increased drought severity and duration in the western and southwestern United States.

- There is a trend toward reduced mountain snowpack, and earlier spring snowmelt runoff peaks across much of the western United States. This trend is very likely attributable, at least in part, to long-term warming.

- A suite of climate simulations show that the United States may experience increased runoff in eastern regions, gradually transitioning to little change in the Missouri and lower Mississippi, to substantial decreases in annual runoff in the interior of the west (Colorado and Great Basin).

# Agricultural Sources of Greenhouse Gas Emissions

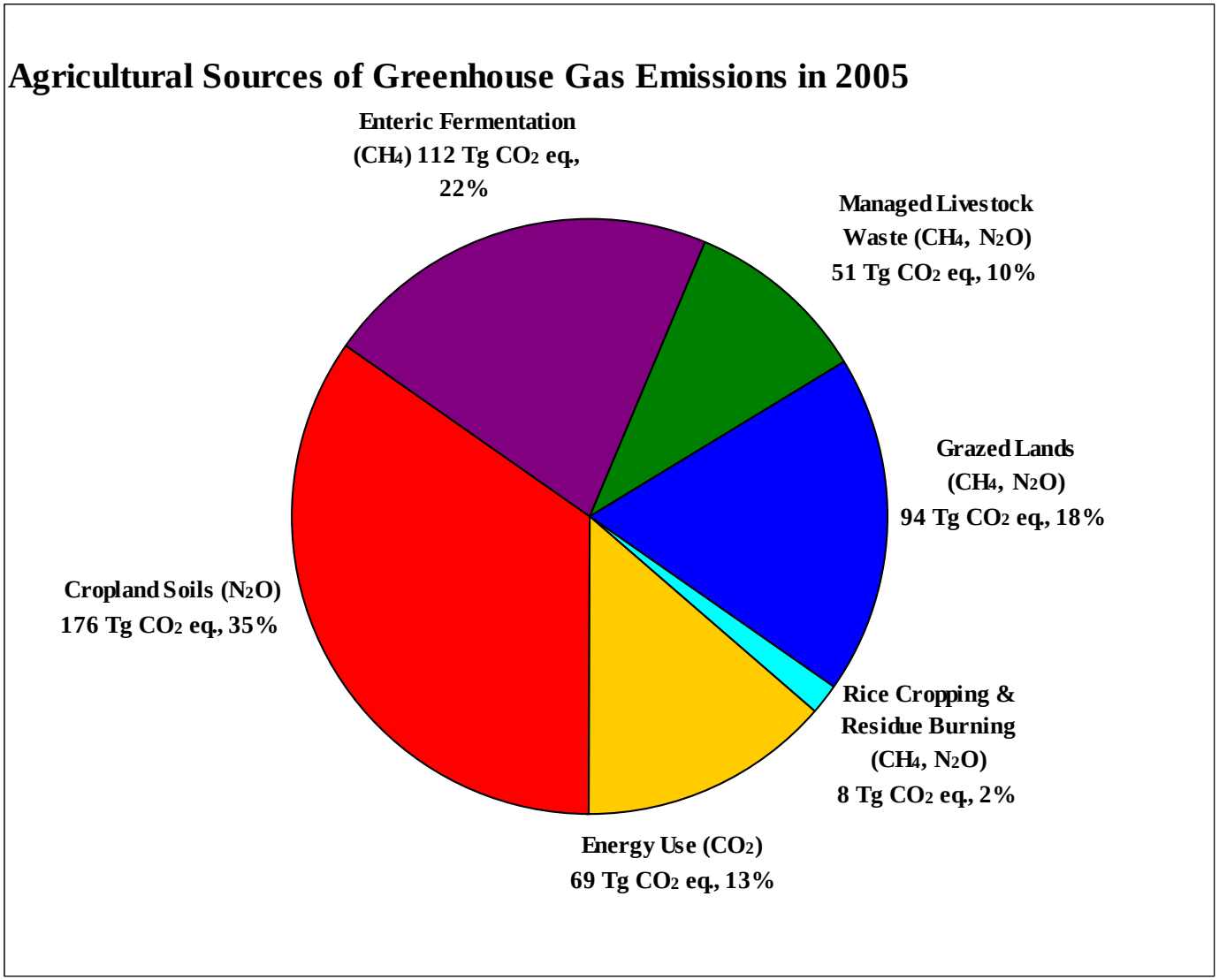
# U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990-2005

Overview

- USDA periodically produces this report to provide resource planners and managers with operational scale estimates of GHG fluxes.
- The report is prepared in cooperation with EPA and is consistent with their national inventory reports

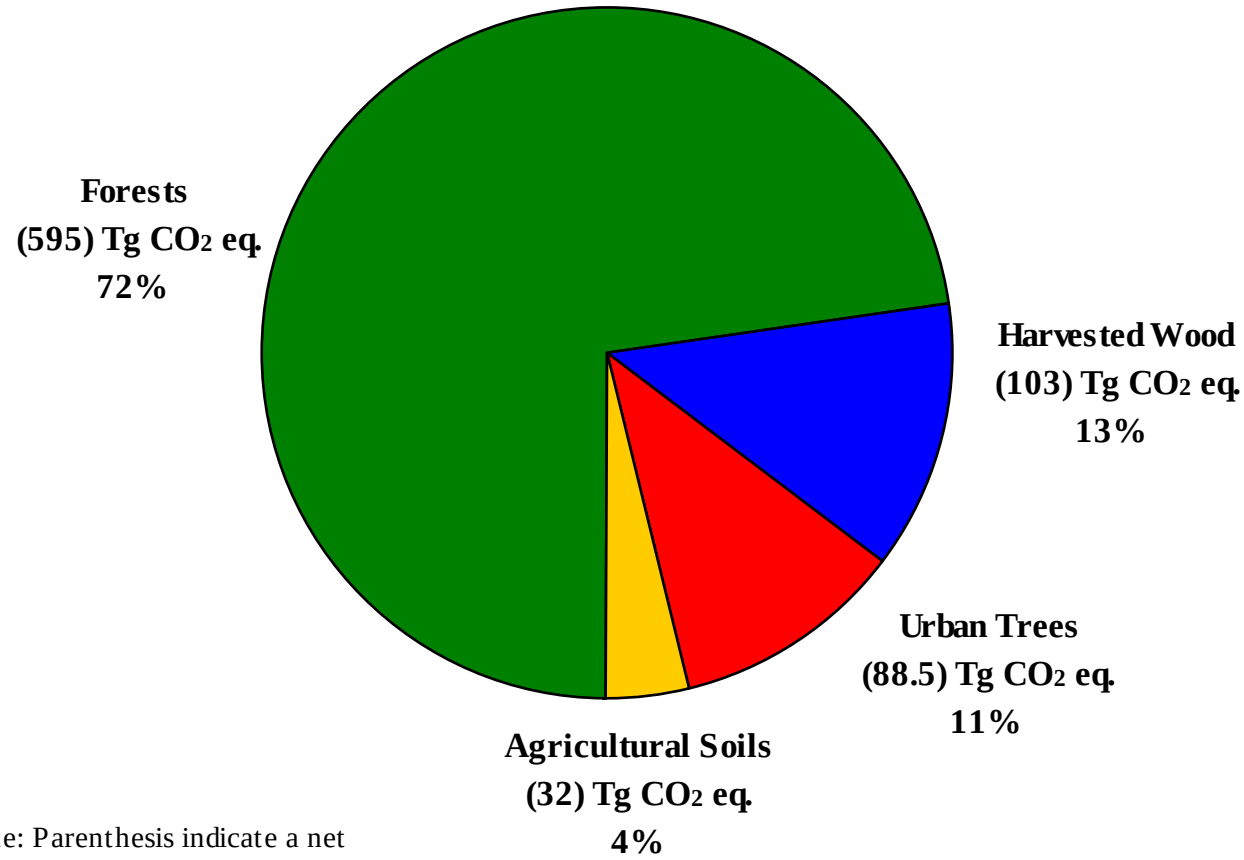
Summary findings:

- Agriculture accounts for close to 7% of total U.S. GHG emissions.
- Forests and soils sequestered roughly 800 Tg CO2 in 2005, offsetting almost 11% of U.S. GHG emissions.



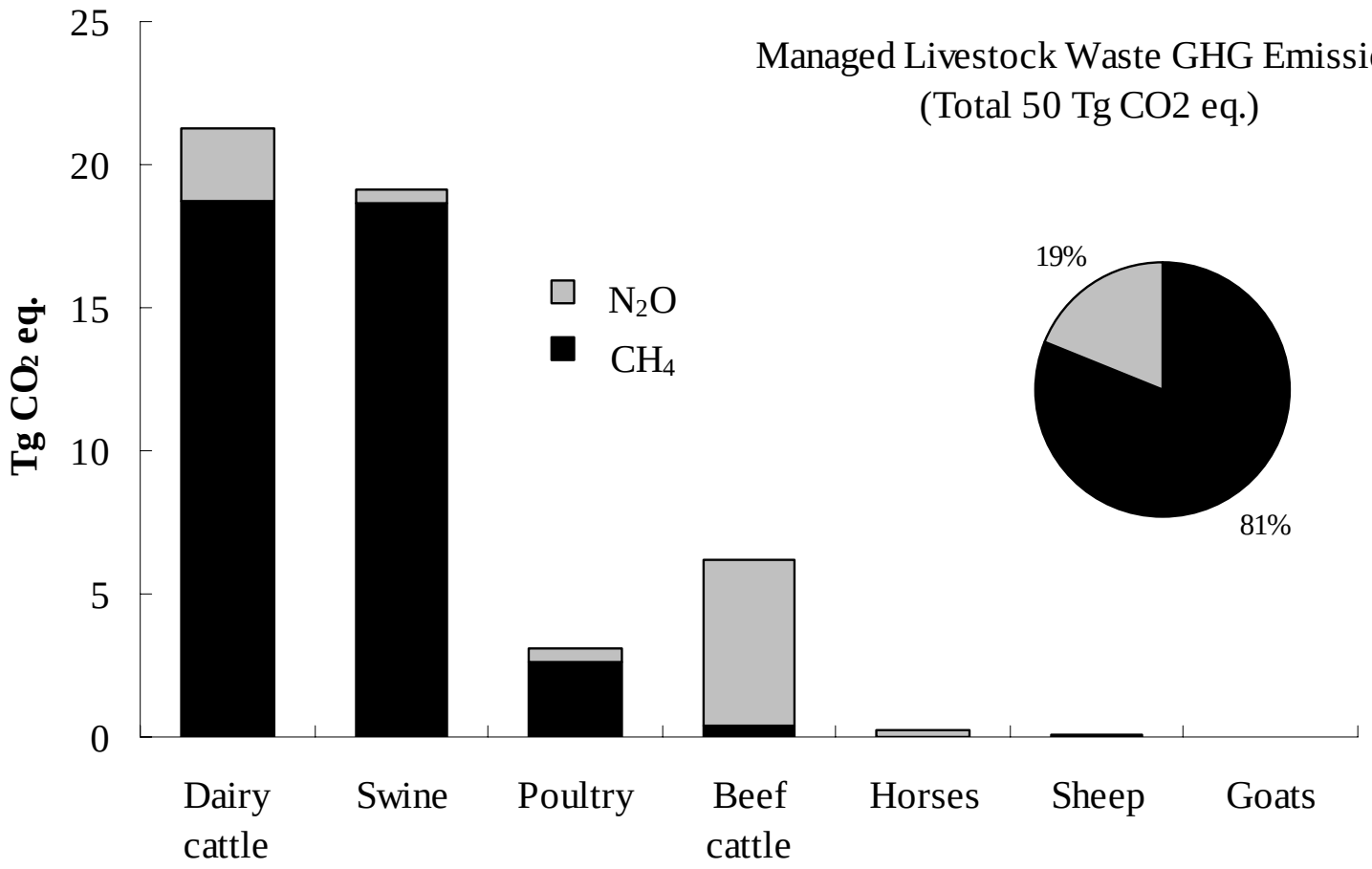

All figures taken from: **U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990-2005**. Global Change Program Office, Office of the Chief Economist, U.S. Department of Agriculture. Technical Bulletin No. 1921. 161 pp. August, 2008. http://www.usda.gov/oce/global_change/AFGGInventory1990_2005.htm.

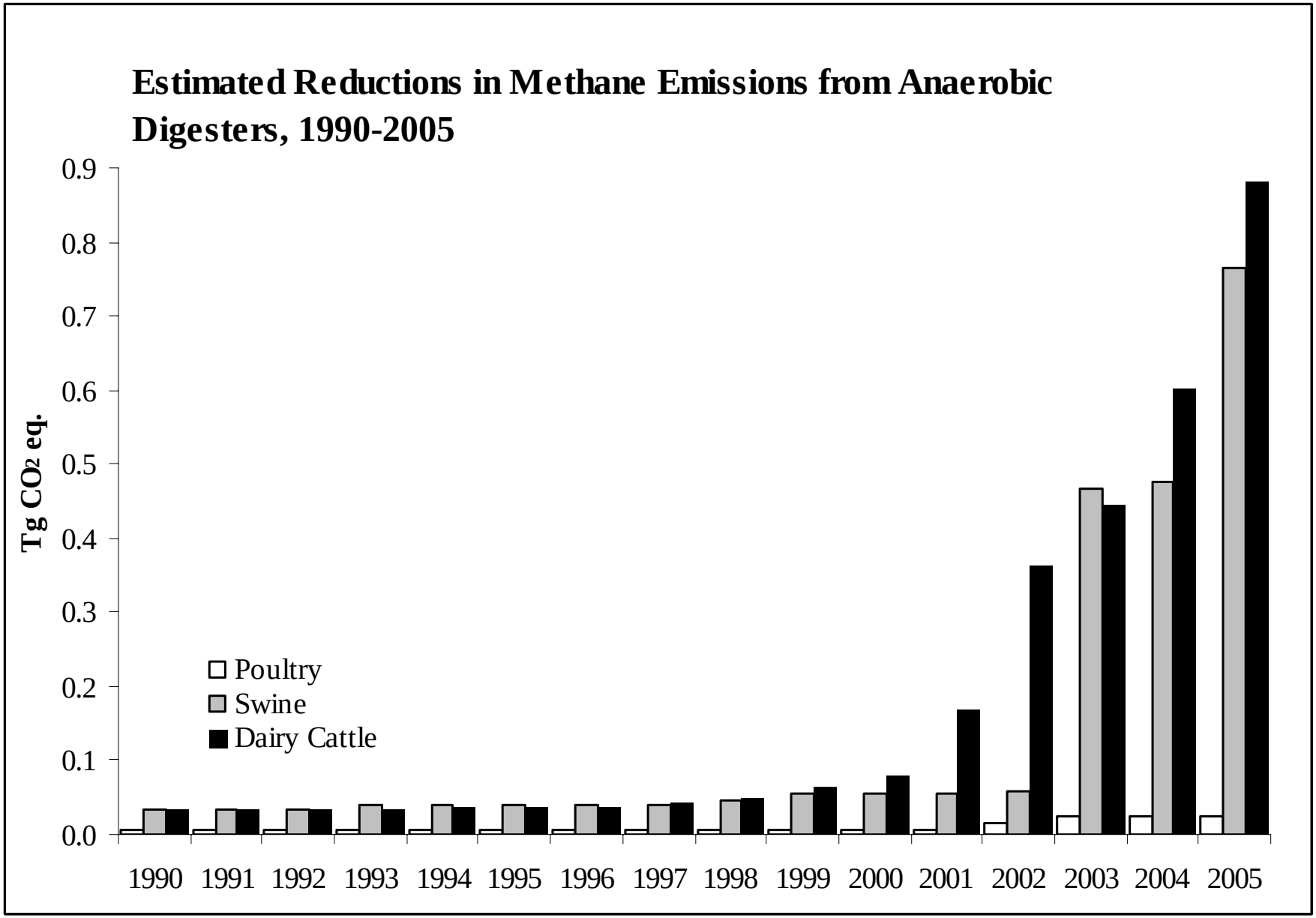
# Agricultural Sinks of Carbon Dioxide in 2005



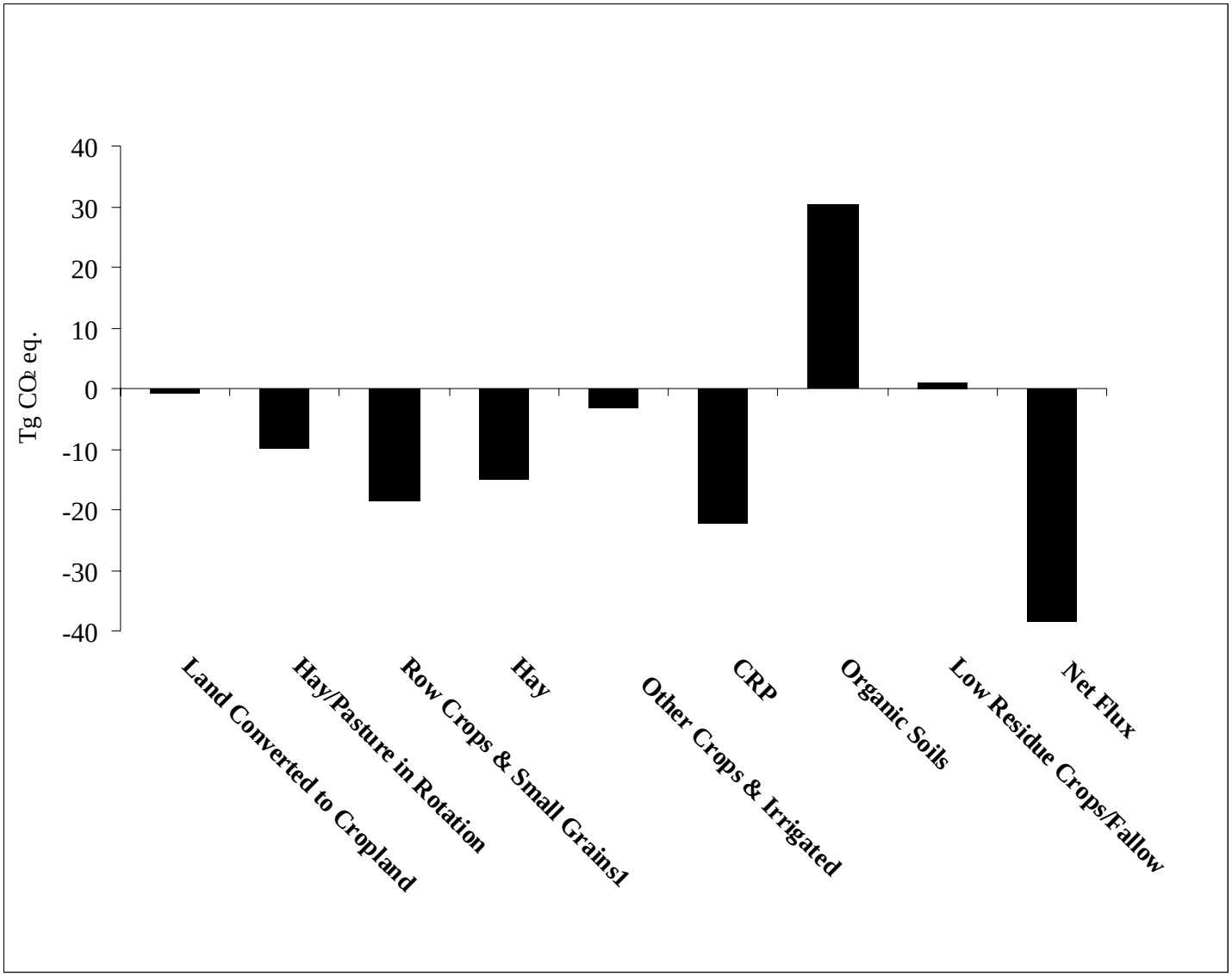

Note: Parenthesis indicate a net sequestration.

## Greenhouse Gas Emissions from Managed Livestock Waste by Livestock Type in 2005




Estimated Reductions in Methane Emissions from Anaerobic Digesters, 1990-2005
Tg CO2 eq.
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Poultry
Swine
Dairy Cattle
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005

# $CO_2$ Emissions and Sequestration from Cropland Soils, 2005



# USDA Climate Change Science Strategic Plan

Vision:  Farmers, foresters, ranchers, land owners, resource managers, and Federal agencies empowered with science based knowledge to manage the risks, challenges, and opportunities of climate change and positioned to reduce the concentration of greenhouse gases in the atmosphere

# Strategic Plan Goals

- Effects:  Understand the effects of climate change on natural and managed systems
- Adaptation:  Develop knowledge and tools to enable adaptation and improve the resilience of natural and managed systems
- Mitigation:  Develop knowledge and tools to enhance the contribution of land management practices to reduce the concentration of greenhouse gases in the atmosphere
- Decision support:  Provide information and tools to improve decision making

# Enabling Activities

- Assessments
- Data and observations
- Analysis and modeling
- Communication, outreach, and education

# Needs from other Agencies and Departments

- Improved regional climate change forecasts at scales appropriate for research and decision-making;
- Improved projections of atmospheric CO2 and other greenhouse gas concentrations;
- Assessments of regional water availability for industrial, societal, and agricultural needs;
- Assessments of sea-level rise and threats to coastal zones and aquaculture systems;
- Improved collaboration on K-12 education, dissemination and extension; and
- Improved satellite imagery for assessing land cover and land use change and hydrological changes.

# Next Steps

- We received over 50 pages of comments from over 30 groups in response to the FRN
- We held an internal experts meeting to establish priorities
- The draft plan is being prepared for review and clearance
- We will release a draft for public comment
- Agencies are being asked to identify examples of agency actions that respond to the goals
- Implementation of the plan will occur across the Department
  - Reflect elements in the next Department strategic plan
  - ARS and FS are developing long-term research plans for climate change
  - Other agencies will reflect elements of the plan in their planning and actions
- We welcome input from the AAQTF